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A preliminary Revision of the North American Isotheciaceae.

By A. J. Grout.

During the past winter a critical study of this family of mosses has been made at the Herbarium of Columbia University. Wishing to obtain more material illustrating the distribution of the species, a brief summary is here presented, giving the distribution, so far as can be determined, from material at hand. Persons having specimens from outside the range here indicated will confer a great favor by sending them to me at the Herbarium of Columbia University. If duplicates can also be sent, a suitable return will be made for them. I am already greatly indebted to several persons for aid in my work, for which acknowledgments will be made in the final publication.

ISOTHECIACEAE Spruce, Ann. and Mag. Nat. Hist. (II.) **3**: 285. 1849.

Gametophyte generally large, never minute. Primary stems creeping, radiculose. Paraphyllia lacking (except in *Climacium*). Leaves smooth, often plicate or concave; median leaf-cells linear, alar cells quadrate (except in *Holmgrenia*).

Sporophyte. Seta smooth, twisted. Calyptra cucullate. Operculum conic to conic-rostrate. Columella persistent. Capsule erect, straight, not conspicuously contracted under the mouth when dry. Peristome double, well developed; teeth lanceolate, articulate. Segments of endostome linear to lanceolate, attached

to a narrow basal membrane, free, or adherent to the teeth in two species of *Pylaisiella*; cilia rudimentary or wanting. Spores roughened.

Distinguished from the Brachytheciaceae by the straight erect capsule, absence of cilia, short basal membrane, capsule not contracted under the mouth when dry.

Homalothecium and certain species of *Brachythecium* (notably *B. acuminatum*) have the capsule characters of this family, but their other characters show their relationship to be with the Brachytheciaceae.

Key to the Genera.

Leaves veined, vein single, extending to the middle of the leaf or beyond.
4. CLIMACIUM.

Leaves veinless or the veins short and double.
Alar cells not quadrate. 3. HOLMGRENIA (*Orthothecium*).
Alar cells quadrate.
Complanate foliate (except *E. repens* and *E. seductrix*) with very large persistent annulus (except *E. Drummondii*).
1. ENTODON (*Cylindrothecium*).
Leaves more or less falcate-secund especially at the tips of branches; annulus narrow. 2. PYLAISIELLA (*Pylaisia*).

1. ENTODON. C. Muell. Linnaea, **18**: 704. 1844. Also Bot. Zeit. **1894**: 740.

[CYLINDROTHECIUM Br. & Sch. Bry. Eur. fasc. 46 and 47. *pl. 464, 465.* 1851.]

Leaves obtuse, quadrate; alar cells of 2 or 3 layers. 7. *E. orthocarpus.*
Leaves acute or acuminate, quadrate, alar cells of one layer.
Leaves gradually narrowly acuminate; segments of endostome adhering to the teeth. 8. *E. brevisetus.*
Leaves acute to apiculate; segments free.
Teeth conspicuously hyaline margined. 6. *E. repens.*
Teeth not conspicuously hyaline margined.
Annulus apparently none; seta yellow. 5. *E. Drummondii.*
Annulus of narrow small cells; seta red. 2. *E. seductrix.*
Annulus large, of large cells.
Teeth uniformly papillose-roughened. 3. *E. compressus.*
Teeth conspicuously striolate above; leaves serrate. 4. *E. Sullivantii.*
Teeth not conspicuously striolate; leaves nearly entire. 1. *E. cladorrhizans.*

1. ENTODON CLADORRHIZANS (Hedw.) C. Muell. Linnaea, **18**: 707. 1844.

Cylindrothecium cladorrhizans Schimp. Syn. Ed. 1: 514. 1860.
Entodon Transylvanicus Demet. Hedwigia, **23**: 81. 1884.
Entodon minutipes Kindb. Can. Rec. Sci. **1894**: 21. 1894.

Not uncommon in North America east of the Mississippi; Minnesota (Holzinger), Iowa (A. S. Hitchcock and Miss McGee).

Limpricht, in Rab. Krypt. Fl. **4**: part 3: 30, separates *E. Schleicheri* of Europe from *E. cladorrhizans* and also cites *E. cladorrhizans* as European. That the two species are distinct can hardly be doubted, if the peristomal teeth be compared. *E. acicularis* C. Muell. and Kindb. in Macoun, Cat. Can. Pl. part 6, 176, [Macoun's 816 (in part) and 170,] is only a peculiar form of *E. cladorrhizans*. It may possibly prove to be a good variety. It is characterized by having a peculiar brownish green color, the tips of branches lighter; very short turgid branches which are largest in the middle and at the largest part bear leaves as large as the stem leaves; capsule and seta much shorter and teeth more perforate than is typical. *E. Transylvanicus* Demeter and *E. minutipes* Kindb. are said by Limpricht, l. c. to be identical, and only slightly divergent forms of *E. cladorrhizans*. I have been unable to see specimens of either.

2. ENTODON SEDUCTRIX (Hedw.) C. Muell. Linnaea, **19**: 214. 1847.

Neckera seductrix Hedw. Spec. Musc. 208. *pl. 47. f. 8–13.* 1801.

Pterigynandrum Carolinianum Brid. Musc. Recent. Suppl. 1: 132. 1803.

Cylindrothecium seductrix Sull. in A. Gray, Man. Ed. 2: 664. 1856.

A very variable species and appropriately named, found only in the eastern United States. Common in the Appalachian region from Canada to the Gulf; less frequent northward and not reported far west of the Mississippi. I have seen no specimens from northern New England or eastern Canada.

Dallas, Texas, (J. Ball), Missouri, Kansas, Wisconsin, Minnesota, Ontario.

2a. E. SEDUCTRIX LANCEOLATUS n. var.

Stem leaves ovate-lanceolate, acute; branch leaves broadly lanceolate, tapering gradually to the serrate acute apex. On rotton wood, Hanging Rock, Wabash Co., Ill., April 3, 1890. (J. Schneck.)

2b. E. SEDUCTRIX MINUS Aust. Mss. in herb.

Entire plant much reduced, dirty green; leaves, seta and capsule shorter than in type. Capsule 1.5–2 mm. long, its length about 3 times its diameter.

Ohio, Sullivant. Sand hill near Augusta, Ga., J. D. Smith, Feb. 2, 1877. A portion of no. 388 of Sull. and Lesq. Musc. Bor. Am., in Columbia Herb., issued as *Cylindrothecium compressum* Br. and Sch. is this variety.

2c. E. SEDUCTRIX DEMETRII (Ren. & Card.).

Entodon Demetrii Ren. & Card. Rev. Bry. **20**: 14. 1893.

Stems irregularly divided and branched, strongly complanate-foliate, slender, having almost exactly the facies of *E. compressus*; leaves ovate, gradually acute, very entire. Peristomal teeth often irregularly perforate.

On stones at top of well, Emma, Saline Co., Mo., Rev. C. H. Demetrio.

3. ENTODON COMPRESSUS (Hedw.) C. Muell. Linnaea, **18**: 707. 1844.

Leskea compressa Hedw. Spec. Musc. 232. *pl. 56. f. 1–7.* 1801.

Cylindrothecium compressum Br. & Sch. Bry. Eur. fasc. 46 and 47. 1851.

Rhode Island, New Jersey, Ohio, Illinois, Kansas, Nebraska, Missouri. Rare.

4. ENTODON SULLIVANTII C. Muell. Can. Rec. Sci. **1894**: 21. 1894.

Neckera Sullivantii C. Muell. Syn. Musc. **2**: 65. 1851.

Cylindrothecium Sullivantii Sull. in A. Gray, Man. Ed. 2: 664. 1856.

North Carolina (Gray and Sullivant), Tennessee (Lesquereux), South Carolina. Very rare.

5. ENTODON DRUMMONDII (Br. & Sch.) Jaeger & Sauerb. Ber. St. Gall. Nat. Gesell. **1876–77**: 282.

Cylindrothecium Drummondii Br. & Sch. Bry. Eur. fasc. 46 and 47. 1851.

Southern U. S., east of the Mississippi, north to Tennessee and North Carolina. Northern Mexico (Pringle).

6. ENTODON REPENS (Brid.).

Pterigynandrum repens Brid. Musc. Recent. Suppl. 1: 131. 1806.

Platygyrium repens Br. & Sch. Bry. Eur. fasc. 46 and 47. *pl. 458.* 1851.

Cylindrothecium repens De Not. Epil. 214. 1869.

North America, east of the Rocky Mountains. Common.

6a. ENTODON REPENS ORTHACLADOS (Kindb.).

Platygyrium repens orthoclados Kindb. in Macoun, Cat. Can. Pl. 6: 172. 1892.

Platygyrium repens sciuroides Limpr. Rab. Krypt. Fl. 4: part 3, 7. 1896.

Platygyrium repens ramulis elongatis Bry. Eur. *pl. 458. f. 3.*

Branches much larger and longer than in the species, leaves larger, loosely imbricate, shortly bicostate.

Ontario, Macoun Canadian Mosses, no. 259.

7. ENTODON ORTHOCARPUS (La Pyl.) Lindb. Musc. Scand. 39. 1829.

Hypnum Schreberi orthocarpum Brid. Bry. Univ. 2: 422. 1827.

Hypnum orthocarpum La Pylaie; Brid. Bry. Univ. 2: 422. 1827.

Cylindrothecium concinnum Schimp. Syn. 515. 1860.

Colorado, Brandegee. Although collected but once and in a sterile state, Brandegee's specimens are undoubtedly this species.

8. ENTODON BREVISETUS (Hook. & Wils.) Jaeger & Sauerb. Ber. St. Gall. Nat. Gesell. **1876–77**: 291.

Neckera breviseta Hook. & Wils. Lond. Jour. Bot. 4: 419. *pl. 24. f. a.* 1842.

Cylindrothecium brevisetum Br. & Sch. Bry. Eur. fasc. 46–47. 1851.

New Jersey, Virginia, Pennsylvania, Ohio, Missouri, Canaan Forks, New Brunswick (J. Moser). Rare.

ENTODON MACOUNII C. Muell. & Kindb. in Macoun, Cat. Can. Pl. 6: 177. 1892.

Authentic specimens from type locality in Herb. Macoun are not referable to *Entodon* at all, but are one of the complanate-foliate Hypneae. Capsules are needed to classify them. There are no quadrate alar cells and the cells at the angles are so little enlarged as to be scarcely noticeable.

ENTODON (?) EXPALLENS C. Muell. & Kindb. in Macoun, Cat. Can. Pl. 6: 177. 1892.

This species belongs to the same group as *E. Macounii.*

ENTODON SUBFLACEUS C. Muell. & Kindb. Can. Rec. Sci. **1894**: 21.

I have been unable to examine any specimens of this species, as Prof. Macoun has none in his herbarium.

CYLINDROTHECIUM FLORIDANUM Duby, Regensb. Flora, **58**: 284, is probably not related to *Entodon*, as the horizontal capsules described are not in accordance with the characters of the genus. We have not been able to obtain a specimen of it, as the type cannot be found in the Duby nor the Boissier herbaria at Geneva.

2. PYLAISIELLA Kindb. Can. Rec. Sci. **1894**: 21.

[PYLAISIA Br. & Sch. Bry. Eur. fasc. 46–47. 1851. Not Desv. 1814.]

The generic name *Pylaisia* was first used by Desvaux in 1814 to designate a new genus named in honor of De La Pylaie. The specimen upon which his genus was founded is stated to be nothing more than a depauperate form of *Hypnum denticulatum* L.

In 1851 Bruch and Schimper took up the name for a new genus founded on *Hypnum polyanthos* Schreb, thus publishing a homonym.

DeNotaris in 1869 extended the genus *Pylaisia* by including *Orthothecium* of the Bryol. Eur., and in this extended form it was degraded by Lindberg in 1879 to a sub-genus of *Stereodon* of Mitten. The name *Pylaisiella* proposed by Kindberg for two species

of the genus, viz.: *P. velutina* and *P. subdenticulata*, is very appropriate, as it will preserve the name of De La Pylaie.

Segments of the endostome entirely free from the teeth.	
Operculum conic; cilia present, rudimentary.	1. *P. polyantha.*
Operculum short, rostrate; cilia lacking.	2. *P. subdenticulata.*
Segments partially or wholly adherent to the teeth:	
Partially adherent; spores 18–24 μ.	3. *P. intricata.*
Wholly adherent; spores 25–30 μ.	4. *P. velutina.*

1. PYLAISIELLA POLYANTHA (Schreb.).

Hypnum polyanthos Schreb. Spicil. Flor. Lips. 97. 1771.

Pylaisia polyantha Br. & Sch. Bry. Eur. fasc. 46 and 47. *pl. 455.* 1851.

Stereodon polyanthos Mitt. Journ. Linn. Soc. **8**: 40. 1865.

Pylaisia heteromalla Br. & Sch. Lond. Jour. Bot. **2**: 669. 1843.

Hypnum polyanthum pallidifolium C. Muell. Syn. **2**: 337. 1851.

Pylaisia Ontariense C. Muell. & Kindb. in Macoun, Cat. Can. Pl. 6: 174. 1892.

Canada and northwestern United States (Macoun); Kakabeka Falls, Ont. (Mrs. Britton); Saskatchewan and Rocky Mountains (Bourgeau); Santa Fé (Fendler); White Mountains (James); Montana (R. S. Williams); Pike's Peak, Colo. (S. L. Clarke); Minnesota (F. F. Wood). Apparently widely distributed in Canada and along the northern border of the United States in mountainous regions, but rather infrequent and local.

The typical American form of this species is quite variable in leaf characters, even on the same plant, but it differs constantly from European specimens in that the leaves are shorter, more abruptly acuminate and more broadly ovate-lanceolate. The length of the leaf of the European form averages 1.5 mm.; that of the American 1 mm., though I have found one plant whose leaves measured 1.4 mm. The length of the acumination of the perichaetial leaves is also very variable. It may be that our forms of this and the next species are but two varieties of the European *P. polyantha.* The American *polyantha* answers very closely to the description of *P. polyantha brevifolia* Lindb. & Aruell, Musc. Asiaebor. 152. 1890. I have seen the type specimens of *P. heteromalla* from Schimper's herbarium and not only are they *P. polyantha*, but

Schimper himself indicated clearly on his labels that he did not consider it a good species; Drummond's no. 222, on which this species was founded, is evidently somewhat mixed, as the Columbia Herbarium specimen is *P. intricata*.

1a. PYLAISIELLA POLYANTHA JAMESII (Sull.) E. G. Britton.

Pylaisia Jamesii Sull. & Lesq. Musc. Bor. Am. Ed. 2. 383. 1865.

Pylaisia subdenticulata obscura Lesq. & James, Mosses N. A. 309. 1884.

Gametophyte smaller than the type; leaves shorter, broadly ovate-lanceolate, shortly bicostate; length of leaf-cells 4–6 times their diameter; quadrate alar cells numerous; perichaetial leaves shorter, abruptly acuminate.

Sporophyte with shorter subulate-lanceolate peristomal teeth, which are also shorter than the segments.

On the ground and roots of trees. Chelsea, Mass. (James.)

This variety has the appearance of *P. subdenticulata* because of its reduced size, otherwise it has the characters of American *polyantha*, such as conic operculum and rudimentary cilia.

1b. PYLAISIELLA POLYANTHA PSEUDO-PLATYGYRIA (Kindb.).

Pylaisia pseudo-platygyrium Kindb.; Macoun, Cat. Can. Pl. 6: 173. 1892.

Pylaisia filari-acuminata Kindb. l. c. 174.

Leaves narrowly long-acuminate; upper branch leaves distantly serrate-dentate along sides of acumination; inner perichaetial leaves often long-acuminate, serrate-dentate along the acumination; cilia 1 or 2, better developed than in the type.

Type locality, shores of Lake Nipigon, Ontario. Also found on the west side of the Columbia River, at Revelstoke, B. C.

On decayed trunks and on "logs subject to inundation."

Exsiccata: Macoun, Can. Musc. 626. (*Pylaisia filari-acuminata.*)

2. PYLAISIELLA SUBDENTICULATA (Schimp.) Kindb. Can. Rec. Sci. 1894: 22.

Pylaisia subdenticulata Schimp. Bry. Eur. fasc. 46 and 47. 1851.

Pylaisia denticulata Sull. in A. Gray, Man. Ed. 2, 62. 1856. New York and New Jersey (Austin); Maryland (Holzinger); Ohio (H. J. Biddlecome); Athens, Ill. (Hall). Very close to *P.*

polyantha, but distinguished by the reduced size, rostrate operculum and absence of cilia.

3. PYLAISIELLA INTRICATA (Hedw.).

Pterigynandrum intricatum Hedw. Spec. Musc. 85. *pl. 18*. 1801.
Pylaisia intricata Schimp. Bry. Eur. fasc. 46 and 47. 1851.
Hypnum intricatum C. Muell. Syn. 2: 338. 1851.
Stereodan intricatus Lindb. Musc. Asiae-bor. 2: 151. 1890.
Pylaisia Selwinii Kindb. Ott. Nat. 2: 156. 1889.

Common in the northeastern United States and eastern Canada, Kansas, Missouri, Misisssippi, Georgia (Ravenal), Florida (Chapman).

This species is easily distisguished by its curved branches, numerous quadrate alar cells and partially adherent segments. It varies a great deal in length of leaves and in length of leaf-cells, length and color of capsule and size of spores. Authentic specimens of *Pylaisia Selwinii* Kindb. show that it is merely a form of this species growing in exposed dry places. The plants are darker and the leaves more strongly recurved than usual.

4. PYLAISIELLA VELUTINA (Schimp.) Kindb. Can. Rec. Sci. **1894**: 21.

Pylaisia velutina Schimp. Bry. Eur. fasc. 46 and 47. 1851.

New Brunswick, and Mt. Desert, Maine, south to North Carolina, west to Ohio and Indiana.

Distinguished from *P. intricata* by the entirely adherent segments, narrower leaves with fewer quadrate alar cells, and larger spores.

Pylaisia revolutifolia Kindb. in Herb. Macoun, from Leamington, Ont., August 4, 1892, and Pelee Point, Ont., is *Entodon repens*.

3. HOLMGRENIA Lindb. Öfv. Vet.-Ak. Förh. **1862**: 605. 1863.

[ORTHOTHECIUM Br. & Sch. Bry. Eur. fasc. 48. 1851. Not Schott. & Endl. Melet. Bot. 31. 1832.]

Gametophyte large (5–10 cm. high); leaves strongly plicate	1. *H. chrysea*.
Gametophyte small (2 cm. high); leaves not plicate.	2. *H. stricta*.

1. HOLMGRENIA CHRYSEA (Schwaegr.) Lindb. Öfv. Vet.-Ak. Förh. **1862**: 605. 1863.

Hypnum chryseum Schwaegr. Schulte's Reise auf. d. Glockner, 2: 364. 1804.

Orthothecium chryseum Br. & Sch. Bry. Eur. fasc. 48. *pl. 461.* 1851.

Very rare. Rocky Mountains (Macoun, Drummond); Saskatchawan (E. Bourgeau).

2. HOLMGRENIA STRICTA Lorentz, Moos Stud. 122. *pl. 5.* 1864.

Stereodon rubellus Mitt. Journ. Linn. Soc. **8**: 40. 1865.

Orthothecium rubellum Kindb. Laubm. Schwed. u. Norw. 46. 1883.

Orthothecium intricatum var. *rubellum* Husnot, Musc. Gall. 173. 1893.

Davis Strait (Taylor). In several sets of Drummond's mosses no. 73, from the Rocky Mountains (distributed as *Catoscopium nigritum*), there is no trace of this species. Dr. Mitten kindly sent a portion of the Davis Strait plant and indicates that *Holmgrenia rufescens* (Dicks.) Lindb. has not yet been found in North America. In a letter dated April 21, 1896, he says: "I have looked through all my specimens of *Orthothecium rufescens* and find no trace of any North American examples. All Taylor sent me are in with *O. chryseum*, as are the 221 of Drummond in both my sets. I suppose I must have mistaken one of Taylor's to be the first named."

4. CLIMACIUM Web. & Mohr, Iter Suec. 96. 1804.

Capsules 3–4 times and median leaf-cells 10 times as long as broad.
1. *C. dendroides.*

Capsules 5–6 times and median leaf-cells 2–7 times as long as broad.
2. *C. Americanum.*

1. CLIMACIUM DENDROIDES Web. & Mohr, Iter Suec. 96. 1804.

The northern and western species. New Brunswick to St. Paul Island, Behring sea, south to New Jersey, Colorado and California. Not represented from Pennsylvania or the North Central States.

1a. CLIMACIUM DENDROIDES OREGONENSE Ren. & Card. Bot. Gaz. 15: 59. 1890.

Type from Oregon, Willamette R. (L. F. Henderson). A specimen from Sauvie's Island, Oregon (C. G. Pringle no. 510), is probably referable to this variety, as the leaves are almost entire, although broader instead of narrower than in the type.

2. CLIMACIUM AMERICANUM Brid. Musc. Suppl. part 2, 45. 1812.

The southern and eastern species, ranging from Canada to North Carolina and probably south to the Gulf; west to Minnesota, Iowa, Illinois and Missouri.

2a. CLIMACIUM AMERICANUM KINDBERGII Ren. & Card. Bot. Gaz. 15: 1890.

C. Americanum fluitans Aust. Musc. App. 49. no. 289. Name only. 1870.

Varying greatly in appearance. Leaves characterized by oblong-hexagonal areolation and lack of auricles. The dendroid form, which is found especially in southern swamps, has often been mistaken for *C. dendroides*. Has the range of the type and extends to the Gulf. The Columbia Herbarium specimens of Sull. & Lesq. Musc. Bor. Am. Ed. 2, no. 42, and Drummond's Musc. Am. (Southern States), 120, are this variety.

CLIMACIUM RUTHENICUM Lindb. is not a *Climacium*. Its affinities are uncertain, but is not one of the Isotheciaceae.

HOMALOTHECIUM Br. & Sch. Bry. Eur. fasc. 46 and 47. 1851.

This genus is so closely allied to *Camptothecium* that it is clearly a violation of natural relationships to put it in another family. The nearly erect and symmetric capsule and the incomplete peristome are the only characters associating *Homalothecium* with the Isotheciaceae.

ISOTHECIUM Brid. Bryol. Univ. 2: 355. *pl. 10.* 1827.

Schimper, Synopsis, Ed. 2; 662, separates *Isothecium myosuroides* (L.) Brid. from the genus of which *I. myurum* (Pollich) Brid. remains the type. *I. myosuroides* clearly belongs to the Brachytheciaceae and all our American species are closely allied to it. Thus we have no American species of *Isothecium*.

Revision of the Genus Asimina in North America.

By Geo. V. Nash.

The genus *Asimina* was founded by Adanson * in 1763. Catesby's † figure, on which Linnaeus ‡ based his *Annona triloba*, is cited by Adanson, thus leaving no doubt as to the type of the genus. In 1803, Michaux § gave the name of *Orchidocarpum* to this group of plants, probably from the resemblance of the young carpels to the tuberous roots of many members of the Orchidaceae. Torrey and Gray ‖ merged *Asimina* in *Uvaria*, to which it cannot be referred, the difference in size of the outer and inner petals readily separating it from that genus. This was the view later held by Dr. Gray, as set forth in the Botanical Gazette,** where the characters, maintaining *Asimina* as distinct from *Uvaria* and worthy of generic rank, are indicated.

The genus is restricted to North America, with a possible extension into Mexico, if the three or four imperfectly known species occurring there prove to belong to this genus, a question about which there is considerable doubt. The forms from the West Indies, placed here by Grisebach,†† would seem to belong elsewhere, the uniform size of the outer and inner petals excluding them from *Asimina*.

In North America the genus *Asimina* is mainly confined to the southeastern parts of the United States, one species only, *A. triloba*, occurring as far north as southern New York and Michigan, and extending to the west, along the Gulf, as far as eastern Texas. This appears to be the only one that occurs any great distance beyond the general range of the genus, with the possible exception of *A. parviflora*, which, according to Dr. Chapman, in his Flora of the Southern States, occurs in North Carolina. I have

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* Fam. Pl. 2: 365.
† Nat. Hist. 2: 85. *pl. 85.*
‡ Sp. Pl. 537. 1753.
§ Fl. Bor. Am. 1: 329.
‖ Fl. N. A. 1: 45. 1838.
** 11: 161–2. 1886.
†† Cat. Pl. Cub. 3. 1866.

seen no specimens authenticating this, however; in fact, Georgia is the most northern state from which I have seen specimens of this species. The remainder of the genus is confined to Georgia, Florida and Alabama.

Asimina, as here understood, comprises seven species, one of which, though quite common in herbaria, has remained undescribed up to the present time, owing to its early and wrong identification with the *A. grandiflora* of Dunal,* which was based on the *Annona grandiflora* of Bartram.† These excellent figures, and the description accompanying that of Dunal, make it difficult to understand why such a mistake should have occurred. This matter will be discussed later, in its proper place.

A large number of specimens, contained in the herbarium of Columbia University, has been examined. In addition to these, the material in the National Herbarium and that in the herbarium of Prof. Lester F. Ward, at Washington, have been kindly loaned for examination. The study of this material has seemed to warrant the following disposition of the species.

Key to the Species.

Flowers borne in the axils of the deciduous leaves of the preceding year, hence appearing before or with the leaves.

Leaves thin, not reticulated; a solitary purple flower in the axil.

Mature outer petals 2 cm. long or larger, more than twice the length of the sepals; a small tree 3–12 metres high. 1. *A. triloba.*

Mature outer petals 1 cm. long or smaller, less than twice as long as the sepals; a small shrub 15 dm. high or less. 2. *A. parviflora.*

Leaves thick, leathery and reticulated when old; 1 or 2 yellowish white flowers and often a branchlet arising from the same axil.

Young leaves sparingly tomentose above and soon glabrous, tomentose beneath; mature outer petals 2.5–4 cm. long. 3. *A. reticulata.*

Young leaves densely tomentose on both sides; mature outer petals 4–5 cm. long. 4. *A. speciosa.*

Flowers terminal, or borne in the axils of the leaves of the season, hence appearing after the leaves.

Flowers terminal, sessile or nearly so; leaves short and broad, obovate to oval. 5. *A. obovata.*

Flowers axillary and long-peduncled, rarely single and terminal in No. 7; leaves long and narrow, oblanceolate to oblong.

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* Monog. Anon. *pl. 11.* 1817.

† Travels, *pl. 2.* 1791.

Mature outer petals 3 cm. long or less, changing color, becoming deep black-purple at the time of falling. 6. *A. pygmaea.*

Mature outer petals 3.5 cm. long or more, not changing color, remaining yellowish white at the time of falling. 7. *A. angustifolia*

1. ASIMINA TRILOBA (L.) Dunal, Monog. Anon. 83. 1817.

Anonna triloba L. Sp. Pl. 537. 1753.

Orchidocarpum arietinum Michx. Fl. Bor. Am. 1: 329. 1803.

Porcelia triloba Pers. Syn. 2: 95. 1807.

Uvaria triloba Torr. & Gr. Fl. N. A. 1: 45. 1838.

A small tree, 3–12 metres tall, the bark of the mature branchlets reddish brown or sometimes gray. Branchlets and leaves when young, peduncles, exterior surface of the sepals and young petals tomentose with reddish brown hairs; mature leaves obovate or obovate-cuneate, 10–30 cm. long, 4–11 cm. wide, abruptly acuminate at the apex, usually acute, but sometimes rounded at the base, thin, glabrous above, the midrib and primary nerves, which are prominent on the lower surface, usually more or less pubescent; petioles 1 cm. long or less, glabrous or sparingly pubescent; flowers in the axils of the deciduous leaves of the preceding year, on peduncles 8–15 mm. long, which are often recurved; sepals from ovate to orbicular-ovate, 8–12 mm. long; petals at first greenish, later purple and conspicuously veined, the outer ones nearly orbicular, 2–2.5 cm. long, more than twice the length of the sepals; fruit 7–15 cm. long, 2.5–4 cm. thick, oblong, cylindric, when full grown at first hard, green and glaucous, later turning yellow, and when fully ripe becoming soft and edible and brown or almost black in color; seeds brown, oblong, 2–2.5 cm. long, 1–1.5 cm. broad, compressed, obtuse at the apex and usually obliquely truncate at the hilum.

Rich and moist soil from western New York and Pennsylvania to southern Michigan and Kansas, south to middle Florida and eastern Texas.

A large number of specimens of this, the most frequent and widely distributed species, were examined, but it is so well known that a detailed list is not necessary.

2. ASIMINA PARVIFLORA (Michx.) Dunal, Monog. Anon 82. *pl. 9.* 1817.

Orchidocarpum parviflorum Michx. Fl. Bor. Am. 1: 329. 1803.

Porcelia parviflora Pers. Syn. 2: 95. 1807.

Uvaria parviflora Torr. & Gr. Fl. N. A. 1: 45. 1838.

A small shrub 15 dm. tall or less, with gray to reddish bark. Branchlets, young leaves, particularly the lower surface, peduncles, and the outside of the young sepals and petals tomentose with bright reddish brown hairs; mature leaves 6–17 cm. long, 3–9 cm. wide, obovate to oblong-obovate, acute at the apex, narrowed at the base, thin, glabrous above, usually more or less tomentose beneath, especially on the midrib and veins; petioles tomentose, 6 mm. long or less; flowers solitary from the axils of the deciduous leaves of the preceding year, on peduncles 5 mm. long or less; sepals ovate, 5–7 mm. long; mature outer petals ovate to broadly oval, 7–10 mm. long, less than twice the length of the sepals; fruit, not fully mature, oblong, about 3 cm. long, sparingly pubescent.

In the low and middle country from North Carolina (according to Dr. Chapman) to Florida, west to Alabama.

Specimens examined:

Georgia: Small, Gwinnett Co., July 20, 1893; Stone Mountain, May 1–18, 1895.

Florida: Curtiss, nos. 85, 4201 and 4545, all from the vicinity of Jacksonville.

Canby, Hibernia, March, 1869.

J. D. Smith, no. 27, Clay Co., March 10, 1883.

Rugel, near Tallahassee, April, 1843.

Chapman, no data.

Le Conte, no data.

Alabama: Buckley, April and June.

Winchell, no data.

3. ASIMINA RETICULATA Shuttlw.; Chapm. Fl. S. St. 603. 1884.

Asimina cuneata Shuttlw.; A. Gray, Bot. Gaz. 11: 163. 1886.

A small shrub 5–10 dm. tall, with bark of a grayish brown to brown color, the branchlets, lower surface of the young leaves, peduncles and the exterior surface of the sepals and young petals densely tomentose with reddish brown hairs. Young leaves somewhat tomentose above, soon glabrous; mature leaves narrowly oblong, inclining to narrowly obovate or oblanceolate, 2.5–9 cm. long, .5–2 cm. broad, thick and leathery, glabrous, reticulated, the midrib and nerves prominent beneath; petioles 1–2 mm. long; flowers on peduncles 5–8 mm. long, from the axils of the deciduous leaves of the preceding year, sometimes accompanied by a branchlet; sepals ovate, 5–7 mm. long; mature outer petals oval to obovate, 2.5–4 cm. long, 1.2–1.5 cm. broad,

much exceeding the inner ones and about five times the length of the sepals, pubescent on the outside, particularly toward the base; immature fruit obovate, nearly glabrous.

Pine barrens of Peninsular Florida.

Specimens examined:

Garber, Tampa, May, 1876.

Lester F. & Rosamond Ward, Tampa, February 27, 1891.

Nash, Tampa, no. 2477, August, 1895.

Hubbard, March 1, 1883, no locality.

Simpson, 1880, no locality, but probably in the vicinity of Manatee.

Webber, no. 148, Mt. Dora, Lake Co., March, 1894.

Palmer, no. 6, Fort Capron, Indian River, 1874.

Bates, Merritt's Island, Indian River, March and April, 1889.

4. Asimina speciosa.

Orchidocarpum grandiflorum Michx. Fl. Bor. Am. 1: 330. 1803.?

Porcelia grandiflora Pers. Syn. 2: 95. 1807.?

Uvaria obovata Torr. & Gr. Fl. N. A. 1: 45. 1838.

Asimina grandiflora A. Gray, Bot. Gaz. 11: 163. 1886. Not Dunal. 1817.

A small shrub, 6–12 dm. tall, with gray smooth bark. Branchlets, as well as the peduncles and both surfaces of the young leaves, densely tomentose with yellowish or tawny hairs; mature leaves oblong, narrowly obovate or obovate, 7–14 cm. long, 2.5–7 cm. broad, thick and leathery, reticulated, tomentose on both sides, sparingly so above; petioles 3–7 mm. long, densely tomentose; flowers, sometimes accompanied with a branchlet, from the axils of the deciduous leaves of the preceding year, on peduncles 7–18 mm. long; sepals ovate, 6–8 mm. long, tomentose; mature outer petals oval to obovate, 4–5 cm. long, 2.5–3.5 cm. broad, much exceeding the inner ones, and about six times as long as the sepals, pubescent, particularly on the outside near the base; immature fruit glabrous.

This plant has been referred to the *A. grandiflora* Dunal, which was based on *Annona grandiflora* Bartram. It is not that plant, as is plainly indicated by a reference to the excellent figures of Bartram* and of Dunal† where the flowers are shown as terminating

* Travels *pl. 2.* 1791.

† Monog. Anon. *pl. 11.* 1817.

the branchlets. The description of Dunal,* moreover, calls for a plant with sub-sessile flowers and the branchlets and the lower surface of the leaves "rufo-pubescentibus," characters certainly not to be found in *A. speciosa*, the flowers of which are lateral, from the axils of the deciduous leaves of the preceding year, and the pubescence merely yellowish white or tawny. The long peduncles also serve well to distinguish this from the true *A. grandiflora* Dunal, which is described in this revision under the name *A. obovata*.

Sandy pine barrens, southeastern Georgia and East Florida.

Specimens examined:

Georgia: Small, Trader's Hill, Charlton Co., June 12–15, 1895.

Florida: Curtiss, nos. 86, 4,200 and 4,588, and a specimen with no number collected in 1875, all from the vicinity of Jacksonville.

Reynolds, March–May, 1871.

Chapman, East Florida, 1871.

Canby, Hibernia, March, 1869.

Palmer, no. 4, Fort Capron, Indian River, 1874.

5. ASIMINA OBOVATA (Willd.).

Annona grandiflora Bartr. Trav. 18. *pl. 2.* 1791. Not Lamarck. 1786.

Annona obovata Willd. Sp. Pl. 2: 1269. 1800.

A shrub or small tree, 1.5–2 metres tall, with grayish brown bark. Branchlets, petioles and the lower surface of the leaves, especially the midrib and nerves, tomentose with bright reddish brown hairs; leaves 4–10 cm. long, 2–5 cm. broad, narrowly obovate to obovate, or the smaller ones often oval, glabrous above, on petioles 3–5 mm. in length; flowers sessile or nearly so, terminating the branchlets; sepals ovate or oval, 10–12 mm. long, tomentose when young, later glabrate; petals yellowish white, glabrous, mature outer ones obovate, 5–6 cm. long; fruit not seen.

Pine lands in eastern and central peninsular Florida.

Specimens examined:

Nash, no. 178, Eustis, Lake Co., March 1894.

Hulst, DeLand, March, 1891.

Bates, Merritt's Island, Indian River, March and April, 1889.

The earlier publication by Lamarck of an *Annona grandiflora*†

* l. c. 84.

† Encycl. 2: 126. 1786.

invalidates the use of this name by Dunal, so that given by Willdenow is here taken up, being the oldest one available.

6. ASIMINA PYGMAEA (Bartr.) A. Gray.

Annona pygmaea Bartr. Trav. 18. *pl. 1.* 1791.

Asimina pygmaea A Gray, Bot. Gaz. 11: 164. 1886. Not Dunal, 1817.

A small plant, 2–4 dm. tall. Stems simple, or rarely somewhat branched, arcuate, often nearly prostrate, 2–several from the same root, somewhat shrubby below, reddish, glabrous at the base, often tomentose at and near the summit; young leaves more or less tomentose, especially beneath; mature leaves often erect, thereby appearing as if secund, oblong, oblanceolate, or spatulate-obovate, 5–15 cm. long, 1–4 cm. broad, rounded, obtuse or acutish at the apex, acute at the base, glabrous, reticulated, the midrib and principal nerves very prominent beneath, sessile, or on petioles 8 mm. long or less; flowers solitary in the axils, on slender glabrous, or somewhat tomentose, often recurved peduncles 1–1.5 cm. long; sepals ovate, 7–10 mm. long, tomentose when young, glabrate when old; petals greenish and slightly pubescent externally when young, becoming dull black-purple and glabrous at the time of falling, the mature outer ones narrowly obovate, 2–3 cm. long, 8–12 mm. broad; fruit not seen.

Pine lands in eastern and peninsular Florida.

Specimens examined:

Curtiss, nos. 87, 4202 and 4742, all from the vicinity of Jacksonville.

Nash, nos. 359 and 1919, in the vicinity of Eustis, Lake Co.

Palmer, no. 7, Fort Capron, Indian River, 1874.

Burroughs, no data.

Powell, 1872.

7. ASIMINA ANGUSTIFOLIA A. Gray, Bot. Gaz. 11: 163. 1886.

Orchidocarpum pygmaeum Michx. Fl. Bor. Am. 1: 330. 1803.

Porcelia pygmaea Pers. Syn. 2: 95. 1807. ?

Asimina pygmaea Dunal, Monog. Anon. 84. *pl. 10.* 1817.

Uvaria pygmaea Torr. & Gr. Fl. N. A. 1: 45. 1838.

A small shrub, 4–6 cm. tall. Stems several from the same root, erect or reclining, much branched, glabrous excepting at the summit, the old bark gray, the young bark reddish; leaves very variable, 5–20 cm. long, 1–3 cm. broad, linear to oblong-linear or

oblanceolate, acute or obtuse at the apex, acute at the base, glabrous, reticulated, the midrib prominent beneath, sessile, or on petitoles 7 mm. long or less; flowers solitary in the axils of the leaves, or rarely terminating the branches, on slender glabrous or sparingly pubescent peduncles 1–2 cm. long; sepals ovate, nearly glabrous, 1–1.5 cm. long; mature outer petals oblong-obovate to obovate, 3.5–6 cm. long, 2–3 cm. wide, yellowish white, even at the time of falling; fruit, probably not fully grown, cylindric-oblong, about 3 cm. in length.

Pine lands in Georgia and north Florida.

Specimens examined:

Georgia: Small, Albany, Dougherty Co., July, 1895; Bainbridge, Decatur Co., June, 1895; Albany, Dougherty Co., May 24–28, 1895.

Florida: Chapman, Apalachicola.
Curtiss, no. 87 *, Gainesville.
Nash, no. 2153, Lake City, Columbia Co., July 11–19, 1895.
Leavenworth, vicinity of Fort King and Fort Drane.
Alexander, Gadsden Co.
Rugel, between Tallahassee and St. Mark's, May and June, 1843.

The leaves of this plant are most variable in shape. In a specimen collected by Dr. Chapmam at Apalachicola, preserved in the herbarium of Columbia University, they are from 5–8 cm. long and from 1–2 cm. wide. This matches the figure given by Dunal of his *A. pygmaea*,* having the short straight ascending branches and the petals obovate and about 3 cm. long, just as there represented. In the extreme of variation, represented by Curtiss, no. 87 *, and Nash, no. 2153, the leaves are 8–20 cm. long, and only 5–15 mm. wide; the petals narrowly obovate and 5–6 cm. long. There are numerous plants connecting these two extremes; indeed, leaves nearly representing the two forms were noticed on the same plant by the writer during the past summer.

Another form of this plant has a flower terminating the branches and no flowers in the axils of the leaves. This is probably but a variation, and it seems best to refer it to this species. Dr. Small's plant, collected at Albany, Georgia, in May, 1895,

* Monog. Anon. *pl. 10.* 1817.

well represents this form; as does also a specimen secured by Dr. Baldwin in the same State. This last is the type of the variety of *Uvaria pygmaea* mentioned by Torrey and Gray in their Flora of North America.*

The Development of the Antheridium of Targionia hypophylla.†

By Effie B. McFadden.

(Plate 268).

One of the most characteristic of our Californian liverworts is *Targionia hypophylla*, a species common in southwestern Europe, but which has not been described from the eastern United States.‡ The specimens studied were collected mostly in October and November on the slopes of sandy banks in the vicinity of Stanford University.

Targionia is our sole representative of the family Targionieae, which includes the genus *Cyathodium*. *Targionia* is perennial, becoming completely dried up at the end of the rainy season, and remaining so until the rains set in again, when it begins at once to grow actively. The structure of the thallus is similar to that of the typical Marchantiaceae, except that the branching is not usually dichotomous, but instead is largely due to lateral adventitious branches growing from the ventral surface. The antheridial shoots are of this character and may be easily recognized by their flattened oval form, small size and wavy outline.

The antheridia arise in acropetal succession from single superficial cells of the dorsal segment of the apical cell, so that in a vertical longitudinal section of a young plant, nearly all stages of development may be seen. The first division of the primary cell is a transverse one, separating the antheridium proper from the stalk-cell. (Fig. 2.) This is followed by at least two similar walls, but the number varies considerably, four being the greatest number

*1: 45. 1838.

† This study was suggested by Dr. Douglas Houghton Campbell, of Leland Stanford Junior University, and was prepared under his direction.

‡ Underwood's Hepaticae in Gray's Manual, sixth edition, 1889.

found. The second series of divisions are vertical and are formed only in the middle segments and divide each into the quadrants of a circle as seen in cross section. (Fig. 7, b.) The separation of the sperm-cells is brought about by a series of periclinal walls by means of which four central cells in each segment are separated from as many peripheral ones. (Fig. 7, b, c.) The upper and lower segments do not seem to take any part in the formation of sperm-cells, the upper usually being prolonged into a beak, while the lower one forms the base of the antheridium.

The lower of the two divisions of the antheridial mother-cell divides usually by three transverse walls to form a stalk. This stalk may be a single row of cells, or a vertical division may take place, making a double row. (Fig. 6, b.)

The contents of the central cells become much denser than those of the outer ones. The former begin to divide actively, the walls being formed at right angles, thus making a large number of nearly cubical sperm-cells.

From the time the antheridium first becomes recognizable, there is a rapid growth of the cells immediately surrounding it. These grow up about the antheridium, which thus becomes sunk in a deep cavity whose walls are extended into a tubular neck, projecting above the general level of the thallus, and through which the spermatozoids escape.

The wall-cells of the antheridium are very large and distinct, and fill the whole cavity between the body of the antheridium and the wall of the cavity. (Fig. 6, a.)

The complete development of the spermatozoids was not followed, but there was nothing to indicate any variation from what has already been described in other liverworts. The nucleus shows the usual flattened form, after the last division of the central cells, and the sperm-cells remain in pairs. The full grown spermatozoid shows one and one-half complete coils; the two cilia are longer than the body, and the vesicle is plainly evident.

Explanation of Plate 268.

Fig. 1. Male plant with antheridial branches; × 3.

Fig. 2. Vertical longitudinal section; apical cell; two very young antheridia × 400.

Figs. 3, 4, 5. Successive stages in the development of the antheridium; × 400.

Fig. 6, a. Full grown antheridium; × 300; b. stalk showing three rows of cells; × 400.

Fig. 7. Three cross sections from the upper part of an antheridium; a. toward the apex; b. c. lower down; × 400.

Fig. 8. Cross sections from the lower part of an antheridium, d. being the lowest segment; × 400.

Fig. 9. Cross section of a full grown antheridium near the center; × 400.

Fig. 10. a. Full grown spermatozoid; b. sperm-cell with nearly developed spermatozoid.

Notes on Potentilla.—I.

By P. A. Rydberg.

The author has been studying the genus *Potentilla* for some time. The plan is to prepare a revision of the North American Potentilleae and have it published as Volume 2 of the Memoirs from the Department of Botany of Columbia College. It is planned to contain, if possible, full size illustrations of all native species of *Potentilla*, *Horkelia*, *Ivesia*, etc. The best way the author knows of, to secure the coöperation of other botanists is to publish some of the results already obtained. He will regard it as a great favor to be permitted to look over and name any collection of North American species, and will be very thankful for any information, suggestion or criticism that may be given.

It will be seen from the following that my opinion as to the limitation of the species differs widely from those expressed in our manuals and from Dr. Watson's revision of *Potentilla* in the Proceedings of the American Academy of Arts and Sciences, **8**: 549–573. They agree, however, very closely with those held by the late Dr. Christian Lehmann, of Hamburg. This eminent botanist after having studied the genus about forty years, having published several papers on it from time to time, among others a monograph in 1820, and having prepared the text for the genus *Potentilla* in Hooker's Flora Boreali-Americana, issued in 1856 his "Revisio Potentillarum," a quarto of 250 pages and 64 plates. This book, which always will remain as one of our standard works, will serve as the basis of my revision.

In the *glandulosa* group, Dr. Watson includes only two species, viz., *P. arguta* and *P. glandulosa*. Lehmann acknowledged five American species. Of these five, *P. brevifolia* Nutt., must be excluded as the style is not basal. For my part, I think the group contains at least seven or eight species. The additional species were not known to Lehmann, except *P. glutinosa* Nutt., which he included as a variety under *P. fissa* Nutt.

The group is characterized by an erect habit, more or less glandular pubescence, pinnate leaves with rounded or rhomboidal, coasely toothed leaflets, obovate or orbicular, not emarginate petals, very flat anthers, and a nearly basal style, this last character, as far as I know, not being found elsewhere in the genus. In all except one, the style is also fusiform, *i. e.*, swollen near the middle and tapering to both ends. The species belonging to the group are:

POTENTILLA ARGUTA Pursh, Fl. Am. Sept. 736. 1814.

Geum agrimonioides Pursh, Fl. Am. Sept. 351. 1814. Not *Potentilla agrimonioides* Bieb.

This is the only eastern species of the group, extending from New Brunswick to District of Columbia, westward to the foothills of the Rocky Mountains, from Colorado, as far north as Fort Simpson on the Mackenzie River. It differs from the rest by its pubescence, which is coarser, densely hirsute and glandular, by its dense and strict cyme, and its white flowers. Dr. Watson mentions that in the Rocky Mountain region, there is found a form of *P. arguta* with bright yellow flowers. This is probably a mistake, and the specimens referred to belong to the next species.

POTENTILLA GLUTINOSA Nutt; Torr. & Gray, Fl. N. Am. 1: 446. 1838. As a synonym under

P. fissa major Torr. & Gray, *l. c.* Not *P. verna major* Wahl.

P. arguta Nutt. Journ. Acad. Phil. 7: 21. 1834. Not Pursh, 1814.

P. valida Greene, Pittonia, 3: 20. 1896.

It most resembles *P. arguta* in habit, is fully as stout and as pubescent, but the pubescence is finer, the longer hairs villous rather than hirsute. The cyme is open in age, rather flat-topped, the pedicels longer, the sepals thinner and more acute,

and the petals larger, much exceeding the calyx, and bright yellow. It ranges from Vancouver Island and British Columbia to Idaho and Oregon. A specimen also belonging here, without doubt, but less pubescent, has been collected in Utah by Marcus E. Jones. Fendler's no. 197, from Santa Fé Creek, New Mexico, which was included in *P. fissa major* by Lehmann, resembles the typical form except that the petals are smaller, scarcely exceeding the sepals.

POTENTILLA FISSA Nutt.; Torr. & Gray, Fl. N. Am. 1: 446. 1838.

P. glandulosa Am. Auth., not Lindley.

P. scopulorum Greene, Erythea, 1: 4. 1893.

The flowers resemble much those of the preceding, the petals being bright yellow, very large, orbicular, very concave, and much exceeding the ovate-lanceolate long-acuminate sepals; but the habit is very different. *P. fissa* is a low plant, seldom exceeding 2 dm. high, very bushy, with a narrow and few-flowered cyme; also often with some flowers in the axils of the leaves. The leaves most resemble those of the next, but the leaflets are generally more rounded and with stronger veins. The type specimens of *P. scopulorum* are less glandular than the original of *P. fissa*, but very glandular specimens have been collected even in Colorado. *P. fissa* occurs in the higher Rockies. It is common in Colorado, rare in Wyoming, Idaho and Montana.

POTENTILLA GLANDULOSA Lindl. Bot. Reg. 19: *pl. 1583*. 1833.

Resembles *P. glutinosa* in the open many-flowered cyme and general habit, but is a much more slender plant. It resembles *P. fissa* in the leaves, the long sepals and the shorter glandular pubescence, which is sometimes rather sparse. It differs from both by its petals, which are obovate, flat and about equal the sepals. Next to *P. arguta*, it is the most common and has the widest range of the group. It extends from British Columbia and Alberta to the Black Hills of South Dakota and the foot hills of New Mexico and California.

Suksdorf has collected a plant in West Klickitat Co., Wash., which agrees perfectly with *P. glandulosa*, except that the petals are very small, obovate-spatulate and white.

P. Hanseni Greene, Pittonia 3: 20, should perhaps be regarded as a mountain variety of *P. glandulosa* rather than a dis-

tinct species. It differs only in its more slender habit, a slightly denser pubescence, somewhat shorter sepals and a more contracted and few-flowered cyme, a modification perhaps due to the higher altitude. Intermediate forms are not rare. It is common in the higher Sierras of California, Nevada and Arizona.

POTENTILLA LACTEA Greene, Pittonia 3 : 20. 1896.

P. glandulosa lactea Greene, Fl. Frans. 65. 1891.

I can not pronounce on this, as I have not seen specimens The description points toward *P. glandulosa*, except in the color of the petals, which are described as white.

POTENTILLA WRANGELLIANA Fish. & All. Anim. Bot. Ind. Sem. Hort. Bot. Petrop. 1840: 54; Ann. Sci. Nat. (II.) 16: 57. 1841.

P. rupestris Presl, Epim. Bot. 198. 1849. Not L.

P. glandulosa Am. Auth., as Brewer & Wats. Bot. Cal. 1 : 178, and Greene, Fl. Frans. 65, mainly.

This species most resembles *P. glandulosa*, but differs by the larger, more decidedly double-serrate leaflets, the more leafy cyme, which is dichotomously branched, with a short-pedicelled flower in the forks, but principally by the sepals, which are more veiny, oval (not ovate-lanceolate), and abruptly contracted into a small point, almost mucronate. The common form is inclined to become glabrate. Lindley's figure of *P. glandulosa incisa* in Bot. Reg. 23: *pl. 1973*, resembles this species as to the leaves, but the cyme and the sepals are those of *P. glandulosa*. *P. Wrangelliana* is common in California and Oregon, extending into Washington.

P. Oregana Nutt. Mss., is a form of this species, but the stem is glandular and very pubescent with long villous hairs. Torrey and Gray, Fl. N. Am. 1: 446, place it as a synonym of *P. glandulosa*, but its habit and sepals show a close relationship with *P. Wrangelliana*.

POTENTILLA REFLEXA Greene, Pittonia 3:19. 1896.

P. glandulosa reflexa Greene, Fl. Frans. 65. 1891.

This somewhat resembles *P. glandulosa*. The principal difference given by Prof. Greene is that petals and sepals are reflexed in anthesis. As far as I know the species, the following characters may be added: thicker, darker leaves with broader and shorter

teeth, a more slender stem which is inclined to be tinged with red, and a fruiting calyx scarcely larger than that of the next species. According to Prof. Greene, it is common in dry open pine woods of the foot hills of the Sierra Nevada. I have seen specimens from only two collections, viz., Coville & Funston, no. 1355, from Big Tree Cañon, Southern California, 1891; and Mrs. R. M. Austin, Modoc Co., Calif., 1895.

POTENTILLA RHOMBOIDEA n. sp.

P. glandulosa var. *Nevadensis* Wats. Bot. Calif. 1: 178, in part. 1876. Not *P. Nevadensis* Boiss.

Stem low and slender, about 2 dm. high, simple, about 3-leaved, not striate, nearly glabrous or glandular above, with very short hairs. Stipules small, 2–4 mm., ovate and subentire. Basal leaves many, short-petioled, about 3-paired, smooth or beset with a few scattered hairs. Leaflets rhombic-ovate, mostly acute, serrate with acute teeth, the largest ones 1½ cm., seldom 2 cm. long. Stem leaves about 3, similar, the lowest pinnate with about 2 pairs, short-petioled, the other two generally 3-foliolate and subsessile. Flowers few in open cymes, about 1 cm. in diameter. Calyx glandular with very short hairs, sometimes also with a few long hairs; sepals about 8 mm. long in fruit. Bractlets linear-oblong, obtuse or acutish, half the length of the broadly ovate slightly mucronate sepals. Petals yellow, obovate, a little exceeding the sepals. Stamens 15–20. Style nearly basal, filiform, long and slender, in fruit about twice as long as the smooth achene.

It somewhat resembles depauperate *P. glandulosa*, but differs by its longer filiform style, which is not fusiform, by the pubescence which could be called glandular-pruinose, when present, with a few scattered straight hairs on the calyx and the leaves, and by the small fruiting calyx. It reminds us also of *P. brevifolia*, but in the latter the style is not basal and the petals emarginate.

P. rhomboidea is apparently a rare plant. The following specimens have been seen by me:

Nevada, S. Watson; *Montana*, S. Watson, no. 114; *Washington*, W. V. Suksdorf (Mt. Paddo), 1885; *Oregon*, Thomas Howell (Deer Creek Mts.), no. 1128, 1887.

To this group belong also *P. geoides* Bieb. of Tauria, *P. rupestris* L. of Europe and northern Asia, and *P. macrocalyx* Huet du Pav. of the Pyrenees.

Appendages to the Petioles of Liriodendra.

By Arthur Hollick.

(Plates 269, 270.)

In a paper read some time ago before the Club and published in the Bulletin* attention was called to certain wing-like appendages on the petioles of fossil leaves considered to be allied to the living *Liriodendron Tulipifera* L. Referring to the theory advanced by Professor Lester F. Ward in regard to stipular appendages to the petioles of *Platanus*,† that they may represent former basal lobes of the leaf, which have become detached, forming first basilar appendages, then wings to the petioles, and finally stipules, I suggested that we might have a similar example in the case of *Liriodendron*. In other words, that the stipules of the living species had been derived from the wing-like appendages, which in turn had been previously derived from basal leaf lobes.

Since then a series of leaf forms of *Liriodendron* was sent to me by Mr. Edward W. Berry, of Passaic, N. J. They were collected from saplings, seedlings and new shoots from old stumps, and many of them are exceedingly interesting and significant. In the specimen to which I wish to call special attention the blade of the leaf is abnormally broad at the top and narrow at the base. The petiole is short and has broadly winged margins, which extend from the base of the petiole and connect with the base of the leaf blade. On one side there is a sharp sinus where they join, on the other merely a contraction. The nervation of each extends into the other. The question to decide is whether we have stipules adnate to the petiole and leaf blade, or portions of the leaf blade which are acting the part of stipular appendages.

The abnormal shape of the leaf is also significent, suggesting at once the fossil genus *Liriophyllum*, in which at least one species (*L. populoides* Lesq.) is known to possess winged petioles.

On plate 269, for purposes of comparison with our specimen, I have introduced a figure of this species and one which shows

*Bull. Torr. Bot. Club, 21: 467–471. *pl. 220, 221.* 1894.

†Proc. U. S. Nat. Mus. 11: 39–42. *pl. 17–22.* 1888. Am. Nat. 24: 797. 810. *pl. 28.* 1890.

the winged petiole of *Liriodendron alatum* Newb. Also a representation of a large sized stipule from a young shoot, in order to show its nervation.

On plate 270 another abnormal leaf is shown, with imperfectly formed basal lobes, the nervation of which, especially that of the one on the left-hand side, is so strikingly similar to that of the stipule as to attract attention at once. On this plate are also figures of young leaves showing normal position and arrangement of the stipules.

The figures and descriptions are submitted without further comment, largely in the hope that it may induce observers to collect and study abnormal specimens, which often give us a starting point for some important morphological investigation.

Description of Plates.

PLATE 269

Fig. 1. Abnormal leaf of *Liriodendron Tulipifera* L., showing winged appendages to the petiole, from Passaic, N. J.

Fig. 2. *Liriophyllum populoides* Lesq. (Bull. Torrey Bot. Club, *plate 221*, in part.)

Fig. 3. Winged petiole of *Liriodendron alatum* Newb. (Bull. Torrey Bot. Club, *plate 220*, in part.)

Fig. 4. Large stipule of *Liriodendron Tulipifera* L., showing nervation, from Passaic, N. J.

PLATE 270.

Fig. 1. Abnormal leaf of *Liriodendron Tulipfera* L., showing imperfect basal lobes, from Passaic, N. J.

Figs. 2, 3. Young leaves of *Liriodendron Tulipifera* L., showing normal arrangement and position of stipules, from Passaic, N. J.

Description of a supposed new Species of Fossil Wood from Montana.

BY F. H. KNOWLTON.

(PLATE 271.)

For some time the United States Geological Survey has had in preparation a Study Series of Rocks for general educational purposes, which is to contain a series of typical rocks of this country, and in 1891 I was requested to collect for this a set of 250 specimens of silicified wood. This Study Series is to be ac-

companied by a descriptive pamphlet in which the characters, especially the microscopic ones, will be fully set forth. The fossil wood illustrates well the replacement of organic structure by silica, and in preparing the figures and descriptions for the Study Series it was found that it represented an apparently undescribed species of tree, and it has been thought desirable to publish a proper diagnosis in advance of the distribution of the specimens.

This silicified wood was collected in September, 1891, in the Upper Galletin Basin, Montana, just outside of the Yellowstone National Park. The trunk which afforded the specimens was an upright one, about eight feet in height and four feet in diameter, and, as subsequent study has shown, was admirably preserved. As the drawings show, its structure can be made out with almost as much satisfaction as though still living.

The matrix in which the trunk was standing is the characteristic volcanic deposit of the region. It appears to be very similar to, if not indeed identical with, that of the well known Fossil Forest on the Lamar River in the Yellowstone National Park. Its geological age is therefore regarded as probably Miocene.

PITYOXYLON PEALEI n. sp.

Annual ring very pronounced, 2–10 mm. broad; cells of summer wood large, thin-walled; cells of fall wood thick, much compressed; cells of summer wood with a single series of large scattered punctations; medullary rays in a single series of two to about twenty long cells, marked radially with one to three small bordered pits in the width of each wood cell; resin tubes rather numerous, of large size.

Cross Section.—This section (Fig. 1) shows the late fall and early spring wood. The contrast in the size and thickness of the walls makes a very clearly demarked ring. This ring of growth was very broad, being in some cases fully 10 mm. The medullary rays show in this section also as long, slender cells.

Radial Section.—The fine state of preservation is well shown in this section (Figs. 2–4). The cells of the spring and summer wood are very broad and marked with a single series of large scattered bordered pits. The medullary rays are also prominent in this section. They are composed of very long cells, each of which is marked with usually two or three small oblong or nearly circular bordered pits the width of each wood cell.

Tangential Section.—This section (Figs. 5, 6) shows the medullary rays to be arranged in a single series of from two to occasionally twenty superimposed cells. The resin tubes, occurring in the midst of a medullary ray (Fig. 6, enlarged 300) are quite numerous. They are of the usual character.

As far as could be made out, there are no pits or markings on the tangential walls of the wood cells.

I take pleasure in naming this supposed new species of fossil pine in honor of Dr. A. C. Peale, whose party I accompanied when it was obtained, and who has done so much, in connection with the Hayden and later geological surveys, to elucidate the geology of our Western States.

U. S. Geological Survey.

Botanical Notes.

Reseda lutea moving Inland.—In passing through a meadow to-day, a mile or so out of the city upon high ground, my eye was attracted by several greenish lemon colored sprays of a mignonette. By turning to Volume I., Part 1, of the Synoptical Flora, the find is seen to agree with *Reseda lutea* L., which is "sparingly naturalized from Europe" and localized as "Nantucket, Mass. and in ballast ground." The meadow where the specimens were found to-day is neither, and it becomes a new and interesting locality for a rare plant collected but twice before in New Jersey, so far as can be determined, and then on ballast. It is not in Gray's Field Book or Wood's Florist.

Byron D. Halsted.

Rutgers College, May 25, 1896.

Asclepias arenicola n. n. *Asclepias aceratoides* Nash. Bull. Torr. Club, **22**: 154. 1895. Not M. A. Curtis, Am. Journ. Sci. (II.) 7: 407. 1849.

The name which I gave to this new and interesting plant, collected in 1894, had, unknown to me, been previously applied by Curtis to an entirely different member of the genus. It becomes necessary, therefore, to rename the Florida form, and the above is suggested, being descriptive of its habitat. It occurs only in the hottest and driest sand, and is confined to and is the only member

of this genus found in the "scrub," a tract peculiar to peninsular Florida. This so-called "scrub" is hotter in summer and, so I have been informed, colder in winter than any of the surrounding territory, and is the home of some of the most characteristic plants of that part of Florida. GEO. V. NASH.

Two New Serials.—The first number of the "Bulletin of the New York Botanical Garden," containing the act of incorporation, lists of members of the corporation, officers and managers for 1896, provisions for patrons, fellows and annual members, list of patrons, constitution and by-laws, report of the Secretary for 1895, report of the Treasurer for 1895, agreement with Columbia University, an account of recent progress, and an outline map of the site, was distributed to members on April 15th, 1896, and has subsequently been sent to a large number of institutions, journals and societies.

The first number of "Bulletin du Laboratoire de botanique générale de l' université de Genève," edited by Dr. John Briquet Director of the Botanical Garden of Geneva, was also issued on, April 15th, 1896. It contains morphological and anatomical papers by MM. Briquet, Hochreutiner and Tswett, and "Études de biologie florale dans les Alpes occidentales," with three plates, by Briquet.

The Herbarium of Columbia University, and the Herbarium of the New York Botanical Garden.—Botanists and collectors are hereby advised, that specimens, books or pamphlets intended for the Columbia University collections, should be addressed either to Dr. Lucien M. Underwood, Professor of Botany, or to Dr. John K. Small, Curator of the Herbarium. Material intended for the collections of the New York Botanical Garden, should be addressed to Dr. N. L. Britton, Director-in-Chief. All material addressed to Dr. Britton will hereafter be deposited in the collections of the Garden. His address will remain at Columbia University, until further notice.

The agreement entered into between the University and the Garden provides for the deposit of the Columbia collections and botanical library with the Botanical Garden, but the transfer will not take place until the Garden's museum building is completed. Plans for this building have now been drawn. The two collections will be kept on the same floor, but will be treated as distinct.

N. L. BRITTON.

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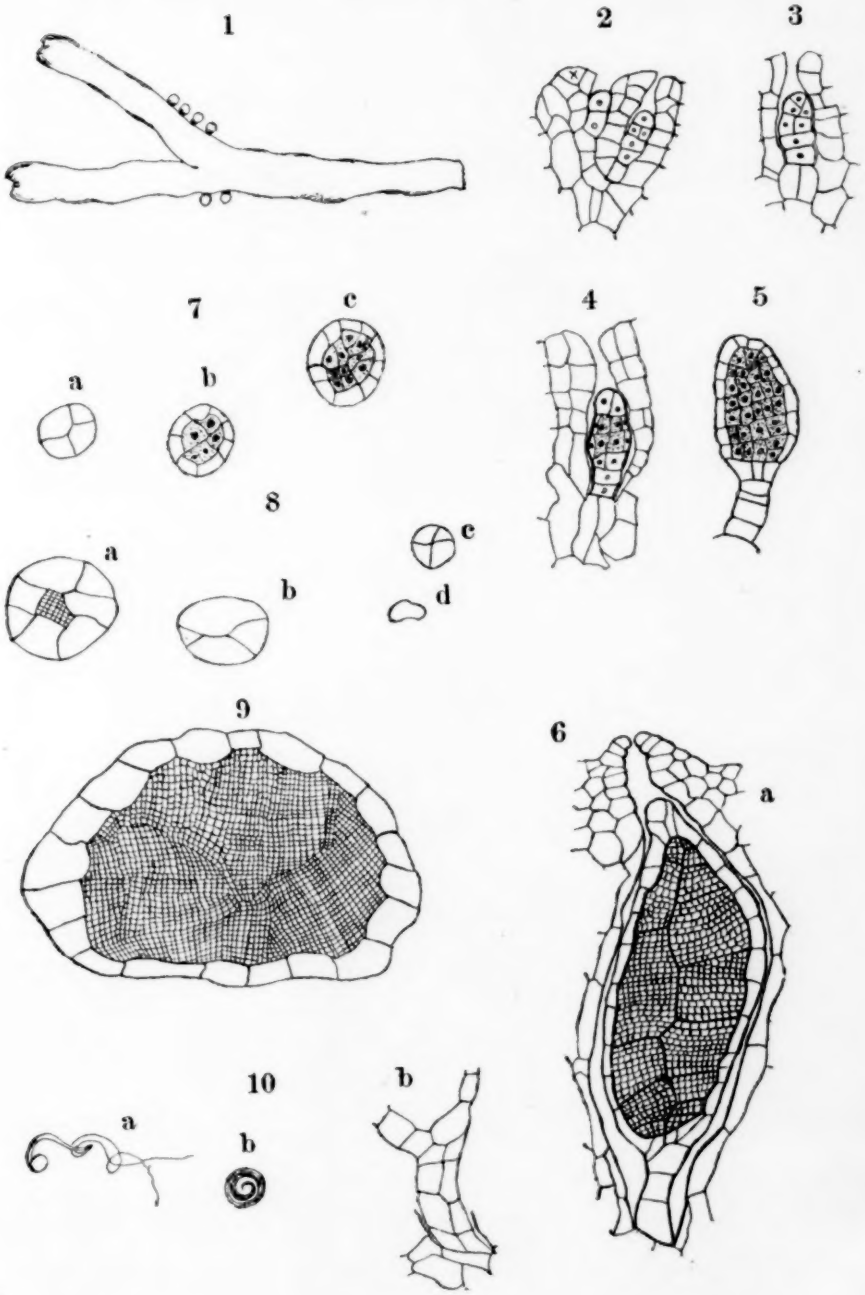
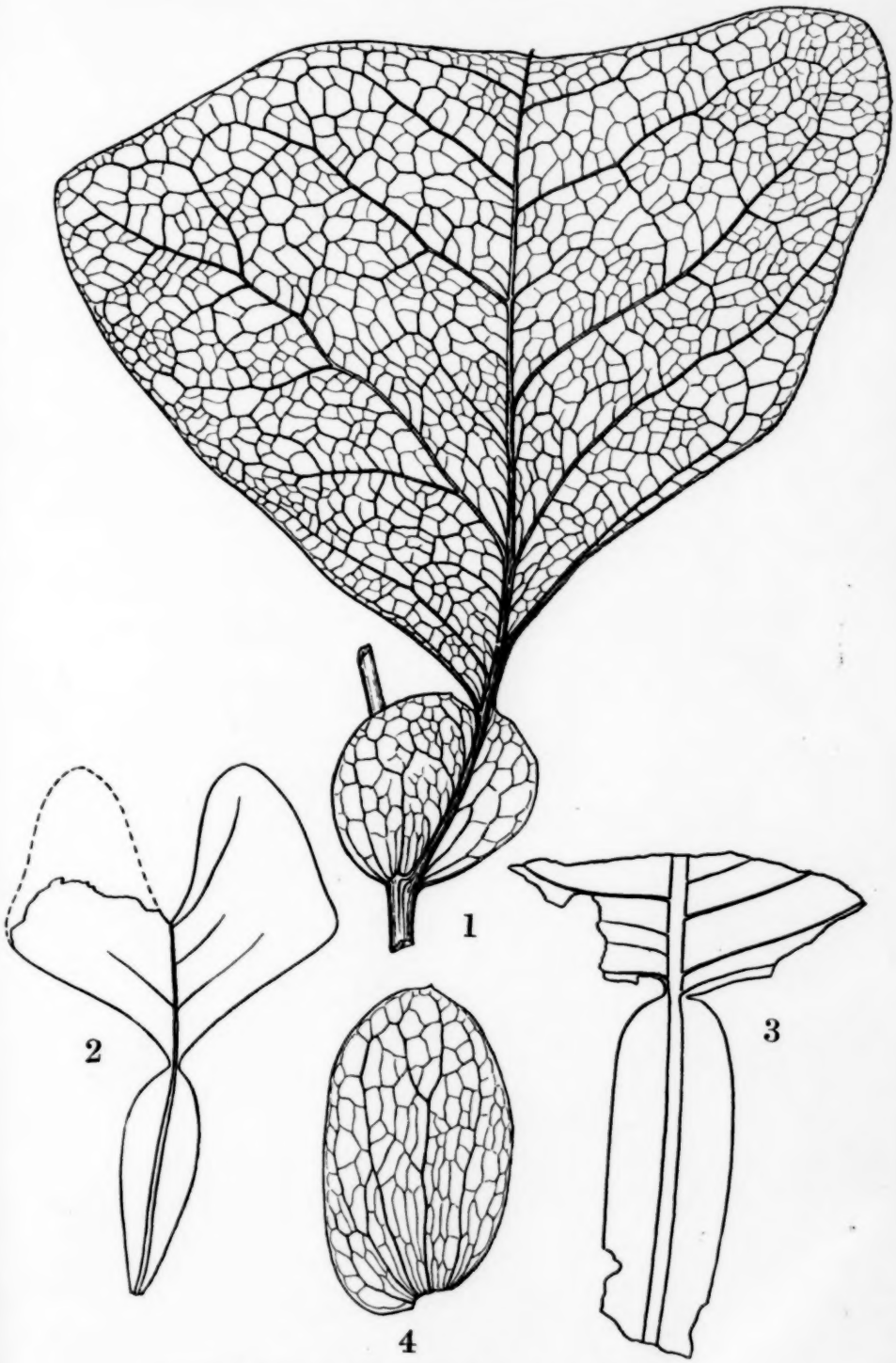
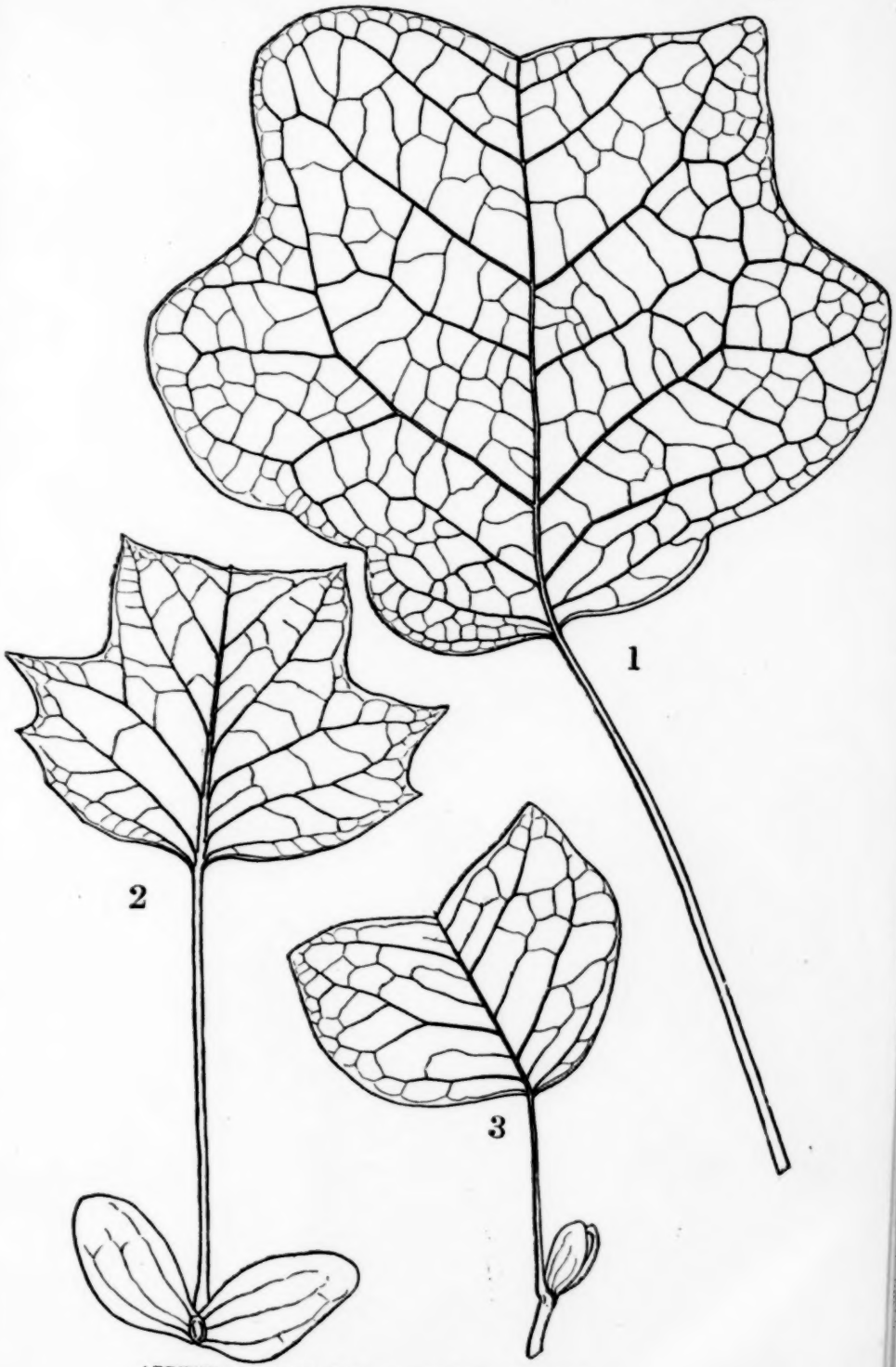


DEVELOPMENT OF THE ANTHERIDIUM IN TARGIONIA HYPOPHYLLA.



APPENDAGES TO THE PETIOLES OF LIRIODENDRON.



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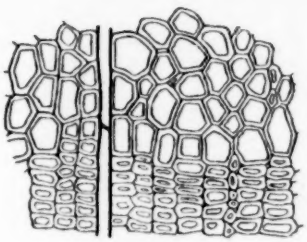

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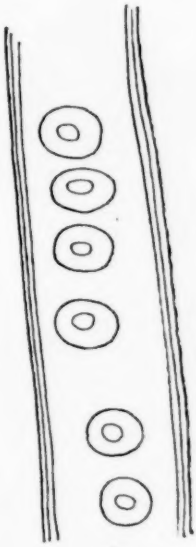

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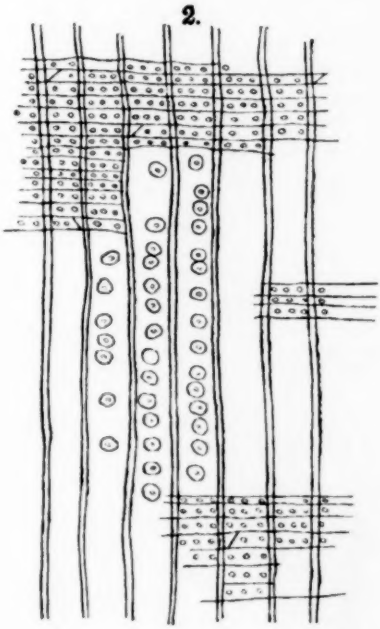

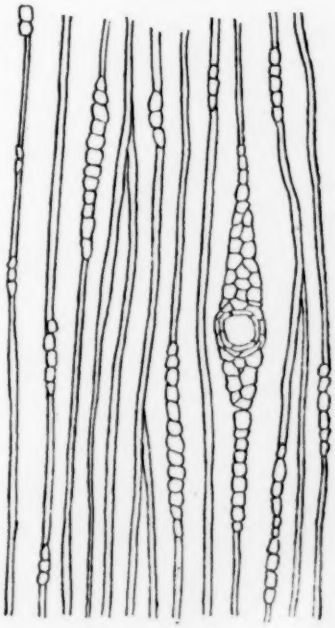

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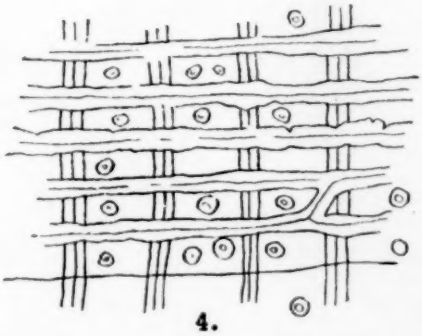

4.

PITOXYLON PEALEI KNOWLTON.

Contributions from the Herbarium of Columbia College.

[The numbers omitted from this list are out of print.]

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The General Floral Characters of the San Francisco and Mogollon Mountains and the Adjacent Region. By H. H. Rusby (1888), ... 25 cents.

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